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XLVII.—*Report of the Results of Researches in Physiological Botany made in the year* 1839. By F. J. Meyen, M.D., Professor of Botany in the University of Berlin.

[Continued from p. 407.]

In the large and splendid works on Fungi which have been published by M. Corda in the past year, we find some observations which are of interest as regards the physiology of these productions. In describing a mould* called *Gonatobotrys simplex*, he says, that in the lower vegetable orders we often see forms represent a lower form of a more highly developed species; and that in the meeting at Prague (1837) he had directed attention to a considerable number of such types which frequently form parallel series, and endeavoured to show that in the inferior Fungi especially mathematical combinations can be formed if symbols are substituted for the separate organs of the mould or fungus; and that each of the members of the series of combinations produced by the combination of these symbols represents one of those groups of forms which we have hitherto been accustomed to regard as types of genera. M. Corda promises to explain these series, both historically and theoretically as well as practically, in a separate work, and hopes that the moulds of the tropical regions may afford several new groups which will fill up the place of the now missing types. In this work M. Corda has also given a plate with figures of *Syzygites megalocarpus*, and a full description of the formation of the fruit, which, as is well known, is here accompanied by the phænomenon of copulation; he observed that the two pyriform warts from which the fruit is produced not only touch each other, but completely coalesce, so that the contents of both can mix as soon as the partitions between them are absorbed. After the junction of these two branches follows the formation of the fruit; in the middle of these connate branches are formed one or two cells, which represent the sporangiolum, which in a ripe state is covered with large angular warts. This sporangiolum contains a thick fluid consisting of oil-globules, molecules, and from two to five spores. Frequently the two branches do not join, and then a spherical sporangiolum is formed at the apex of one or even of both of them.

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M. Corda never saw the sporangium of this curious fungus fall off or open, and the seeds when sown did not succeed.

Finally, M. Corda remarks, that the copulation of these fertile branchlets has been compared to that of certain Confervæ, but that this comparison, on a critical examination of both cases, does not appear to be very correct. I also have compared the copulation of *Syzygites* with that of the Confervæ, and after I have carefully examined all the kinds of copulation which have been observed in Confervæ and Closteriæ, I cannot imagine how M. Corda can make such a statement; it evidently arose from the fact that M. Corda has not examined the phænomena of copulation of the Algæ with as much diligence as he has those of the mould, for, particularly in Closteriæ, the phænomena are quite similar; and in the Spirogyræ I have also seen that the usual spore produced by copulation again appeared as a sporangiolum, and contained several smaller spores, &c.

More important for us are the contents of the third volume of figures of Fungi* which M. Corda has published; we find therein new researches on the genus *Æcidium*, which is not as yet correctly understood. M. Corda refers *Æcidium* to the true Gasteromycetes, on account of its peridium: he sowed the spores of *Æcidium Tussilaginis* on leaves of the Colt'sfoot, which were kept moist, or were immersed in water, and he often succeeded in making them germinate; they developed on the spore-skin, by means of extension, a wart, which became a cellular filament, producing threads in every direction, as is the case with the spores of all Fungi. By degrees a fibrous net, or tissue, is formed out of these threads, similar to that produced by the spores of Fungi, Algæ and Moss; these are said to be true germinative threads, and M. Corda says he has seen them penetrate through the stomata of the epidermis into the parenchym of the leaf, and then commence dividing into branches.

Botanists will readily perceive the importance of these statements: the propagation of the Leaf-fungi has not yet been observed, but a number of hypotheses have been invented to explain it; these will, however, all be done away with, if M. Corda's statement, that the germinative threads of the spores of *Æcidium* pass into the parenchym of the leaf through the stomata, is found to be correct. M. Corda saw, moreover, that the little heaps of *Æcidium*, with their cellular stroma, are fastened on laterally to one of the bundles of vessels in the leaf. These points are illustrated by excellent figures.

The larger half of the volume treats of the *Hymenomycetæ*, to which M. Corda reckons not only the *Helvellaceæ*, *Peziæ*

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and *Tremellinæ*, but also the *Tubercularinæ* and *Coryneaceæ*: however, according to the later observations on the mode of production of the spores, it is absolutely necessary to separate the *Octosporideæ* from the true *Hymenomycetæ* with free spores. It is, however, to be desired that this family of Fungi should receive another name, for the sporangia of the large *Sphæriæ* are also filled with eight spores, and their appearance has much similarity with that of the sporangia of the *Peziæ*, etc. In speaking of the *Peziæ* we have a description of the formation of the spores, from which it appears that the spore-skin is formed round the drops of oil which are found with larger and smaller grains in the asci. Here we also have a new theory of the formation of cells, which the spores of the Fungi, according to M. Corda, represent.

M. Corda treats very circumstantially of the structure of the hymenium in the true *Hymenomycetæ*, and he endeavours to show that the honour of the first exact observations on this subject belongs to him; for in the winter of 1833-34 he had sent to the Academy of Sciences of Berlin a treatise 'On the Structure of the Spores of Cryptogamic Plants,' accompanied with many figures, in which both the free quaternate spores, the antheridiæ, the spore-cuticle, the spore-nucleus and the oily globules, are described and delineated. The greater number of the members of the Academy are said to have thought highly of this work, but the greatest microscopical observer of Germany declared these observations to be incorrect: the free quaternate spores were false; the antheridiæ (and partly also the basidia) were, according to his observations, eggs of insects, &c. In the former Reports for 1836, p. 51—55, and 1838, p. 167, I have given a historical view of the observations made in this department, and I mentioned M. Corda's discoveries as published in the 'Flora' of 1833; however, according to the above, M. Corda shortly afterwards published a new work (that read in the Academy), which certainly gives him the justest claims to the confirmation and extension of Micheli's observations; and if his assertions could be confirmed by a member of the above-mentioned Academy, they are certainly to be put before those of M. Léveillé; the latter, however, states that he had communicated his results ten years ago to Persoon and others*.

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In the description of the hymenium the three usual layers are mentioned, and a circumstantial description of the lacteous vessels which are found in some of the *Agaricini* is given; a splendid figure of these vessels, with the whole hymenium of *Agaricus fœtens*, gives the best information on this subject. In *Ag. fœtens*, says M. Corda, there is found between the cells of the two different cellular systems (namely, the layer of tubes and that of spherical cells) a third system, which is interwoven with the others, and which consists of perfect, branched and anastomosing narrow tubes, which have walls proper to them, and contain a milk-like, half transparent, white granular sap, which appears to move slowly in the direction of the tubes. M. Corda believes he may truly say that he first clearly described and delineated this vascular system in the Fungi, for the drawing which M. Schultz has given of *Agaricus deliciosus* is very confused and unnatural. These lacteous vessels pass through all organs and tissues of *Agaricus fœtens*; they are equally distributed, only the gills and the outer layer of the stipes appear to contain more of them. The tubes are clear, almost always of equal thickness, generally serpentine and much branched: and often the cells of the large-celled parenchym are deposited in rays around the lacteous vessels, and surround them for some distance with a cylindrical layer of cells. Where these vessels approach the surface of a gill they send out peculiar, long, blind (closed) branches, which form with their conical ends the outermost layer of the gill and hymenium. The structure and formation of the organs of fructification are then fully described: the female ones are called, according to Léveillé, basidia; they consist of the body, the spore-supporters (Sterigmata of M. Corda, an appellation which has, however, already been used.—M.), the contents and the spores. The formation is the same as given in the former Report, p. 54. "Every sporophore," says M. Corda, "produces always but one spore at once, and afterwards several one after the other, exactly in the same manner as the terminal points of the fertile flocci of the *Hyphomycetæ*." Whether this assertion is grounded on actual observations is not stated; and I must beg leave to doubt that the formation of spores at the point of the spore-bearer is repeated after the first spores have fallen off. The spores consist, according to M. Corda, of a cuticle, a nucleus, and of oily globules, and where the spores are terminal they have a conical, pointed or blunt perforated wart, and this opening has been formerly called Hylus, window, navel, etc. Spores with the hylus at the side are to be called *sporæ pleurotropæ*, and those which have the hylus in the axis, *sporæ trepanotropæ*; and M. Corda promises to show at a future period in what

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relation an orthotropic ovulum stands to a trepanotropic spore, &c. The oil-globules in the spores are composed, according to M. Corda's analysis, of fatty oil in large quantities and an acrid ætherial oil.

M. Corda also asserts, that in 1833 he pronounced the antheridia of the fleshy Fungi to be anthers, and I have shown in my last Report, that these bodies were first mentioned as generative organs by Bulliard: M. Corda is quite wrong in saying that I stated these organs to be paraphysæ, for such an idea never entered my mind. We have, however, often drawn attention to the curious fact, that the so-called anthers, if they really do effectuate the fertilization of the spores, do not appear more frequently and constantly; and to this M. Corda replies, that there are whole families among the Cryptogams where only spores are found. We may, however, say that this objection does not apply to the Fungi, for we at present know that in those families where male organs have been found, they make their appearance in all genera and all species; in the Fungi on the contrary, and let us only consider the pileiform and fleshy Fungi, these organs do not appear regularly in two very similar species.

M. Corda moreover compares these fungus-anthers with the single pollen-grains of the higher plants, and not with the anthers, a view held probably by most botanists who have written on this subject; he calls them Pollinaria, a denomination which has already been used in quite a different sense. One statement of M. Corda is very remarkable and worthy of further examination, viz. that the *Boleti*, during the development of the anthers, have no trace of the basidia and of the formation of spores, and that these are principally formed when the anthers are almost fully developed. [In *Agaricus* and *Polyporus* I have formerly directed my attention to this subject, but have not observed anything which could lead to this conclusion; and in some species of *Boletus* it is not uncommon to find fully-developed anthers in old, decaying individuals.] M. Corda correctly remarks, that the paraphyses of the *Ascomycetæ* are not to be compared to the anthers of the above-mentioned Fungi. The contents of the anthers are composed, according to M. Corda, of a consistent jelly, which sometimes contains molecules, but sometimes has no distinguishable structure; it is emptied in drops through the point of the cellular sac, and then covers the external surface with a layer of gum, which is often slightly coloured; by means of this substance the spores adhere: whether however, says M. Corda, this fluid fecundates the spore, cannot be ascertained.

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In our former Report* we mentioned a treatise of M. Léveillé's which had been laid before the Philomathic Society at Paris in 1837; it is now published†, although apparently a little altered; moreover there are unfortunately no figures, which are absolutely necessary to illustrate M. Léveillé's views. M. Léveillé contends against the idea of Turpin, that the Uredines are produced from diseased Globuline, by which name M. Turpin means all sap-globules of plants, however different they may be in their chemical composition. Moreover M. Léveillé condemns the view of M. Unger according to which the Uredines are produced by a diseased affection of the respiratory organs; for, according to the author's observations, they are true fungi, among which Persoon placed them. When, says M. Léveillé, these productions are observed in a very young state, there are seen under the discoloured epidermis very fine colourless ramified filaments which are interwoven with each other. When a Uredo is formed, there appears in the centre of this woven mass a fleshy spot or point, which may be compared to a *Sclerotium*, &c. &c; one surface of this nucleus reposes on the parenchym of the leaf, the other is in contact with the epidermis, and is covered with pedunculated, or more rarely with sessile spores. As the fungus increases the epidermis is extended and bursts, and the spores are exposed. The *Æcidia*, although possessing a more complicated structure, have a similar process of development, which M. Léveillé describes in that of *Euphorbia*; the peculiar peridium

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Finally, there is a division of the Uredines into three smaller families: 1. *Æcidineæ*, with the genera *Rœstelia*, Reb.; *Æcidium*, Pers.; *Peridermium*, Link, and *Endophyllum*, Lév. 2. *Uredineæ* with *Phragmidium*, Link; *Puccinia*, Pers.; *Uredo*, Pers.; *Podisoma*, Link, &c. 3. *Ustilagineæ* with *Ustilago*, Link; *Sporisorium*, Ehr., &c.

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In the Report of 1837†, the observation of M. Martens was mentioned, according to which hybrid forms are found among the Ferns; the new hybrid which M. Martens has observed, was called by Bory de St. Vincent *Gymnogramma Martensii*, and was said to be intermediate between *G. calomelanos* and *G. chrysophylla*. Mr. J. Riley‡ of Nottingham has made an excellent reply to this assumption of M. Martens, although he appears not to know that many botanists believe that the anthers of Ferns have been discovered, a subject which was discussed in the former Report, 1836, p. 104. Mr. Riley considers this supposed hybrid as *G. sulphurea*, Desv., and gives very sufficient reasons for supposing the formation of hybrids in the Ferns as altogether improbable.

Mr. G. Dickie§ has published some remarks on the appearance of amylum in plants; he notices particularly that in the Lichens; but it was unknown to him that many decisive observations have been already made on this subject. Mr. Dickie assumes that all those parts of Lichens which are coloured blue by iodine are amylum, and he found that even the sporangia (thecæ) are coloured blue; he compares the sporangium, with the spores which are produced therein, with the structure of the amylum globules; this however is founded on Raspail's description of the structure of Amylum, which is erroneous.

M. G. Körber‖ has chosen as the subject for his inaugural dissertation a very circumstantial description of the green cells of the thallus of Lichens; these are the peculiar cells which Wallroth calls gonidia, and Meyer germinal grains.

The author has given the various statements of the two above-mentioned lichenologists with all possible brevity and clearness, has criticized them, and sometimes added his own views, which are grounded on observations of nature. The *gonidia* were observed in three different stages: 1. as *gonidia*

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M. Braun* has also communicated his ideas on the growth of the *Ophioglosseæ*, particularly with regard to the cellular body from which the leaves are produced. This body is said to surround the centre of formation, and within it the leaves are produced in regular spiral succession until they unfold, which they do in the fourth year in the case of *Oph. vulgatum*. The spike of *Ophioglossum* is axillary. *Botrychium* does not possess this inclosing cellular body, but the leaves have a sheath.

In the Report of 1837†, the observation of M. Martens was mentioned, according to which hybrid forms are found among the Ferns; the new hybrid which M. Martens has observed, was called by Bory de St. Vincent *Gymnogramma Martensii*, and was said to be intermediate between *G. calomelanos* and *G. chrysophylla*. Mr. J. Riley‡ of Nottingham has made an excellent reply to this assumption of M. Martens, although he appears not to know that many botanists believe that the anthers of Ferns have been discovered, a subject which was discussed in the former Report, 1836, p. 104. Mr. Riley considers this supposed hybrid as *G. sulphurea*, Desv., and gives very sufficient reasons for supposing the formation of hybrids in the Ferns as altogether improbable.

Mr. G. Dickie§ has published some remarks on the appearance of amylum in plants; he notices particularly that in the Lichens; but it was unknown to him that many decisive observations have been already made on this subject. Mr. Dickie assumes that all those parts of Lichens which are coloured blue by iodine are amylum, and he found that even the sporangia (thecæ) are coloured blue; he compares the sporangium, with the spores which are produced therein, with the structure of the amylum globules; this however is founded on Raspail's description of the structure of Amylum, which is erroneous.

M. G. Körber‖ has chosen as the subject for his inaugural dissertation a very circumstantial description of the green cells of the thallus of Lichens; these are the peculiar cells which Wallroth calls gonidia, and Meyer germinal grains.

The author has given the various statements of the two above-mentioned lichenologists with all possible brevity and clearness, has criticized them, and sometimes added his own views, which are grounded on observations of nature. The *gonidia* were observed in three different stages: 1. as *gonidia*

* Flora von 1839, p. 301.

† See Mr. Francis's translation: London, R. and J. E. Taylor, 1839, p. 81.

‡ Reply to M. Martens's Paper on the Hybridity of Ferns. Proc. of the Bot. Soc. of London, 1839, p. 60.

§ Annals of Nat. Hist. 1839, p. 165.

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synthetica in statu primario seu primitivo, that is, when they were still in the thallus in their natural position; 2. as *gonidia synthetica in statu secundario,* i. e. when they have risen above the surface of the thallus and form soridia, the appearance of which in the different genera is described. Finally, 3. the *gonidia* are considered as reproductive organs. What Wallroth and Meyer have observed on this subject is correctly stated to be not satisfactory; and the author describes his own experiments, which were made with great care in order to observe the germination or development of the *gonidia*, which however were all unsuccessful. It is to be hoped that M. Körber will continue his observations, for with the help of our improved microscopes, there is doubtless much in this field which remains to be discovered.

Mr. Valentine* has communicated to the Linnæan Society his observations on the development of the organs of fructification of Mosses; they contain, however, nothing that has not been already made known. Mr. Valentine draws attention to the analogy between the spores of Mosses and the pollen-grains of higher plants.

Dr. Stiebel† has written a treatise on the *Oscillatoriæ* which is full of discoveries. According to his observations, the *Oscillatoriæ* are not only animals, but they possess also perfectly-formed heads; they have a mouth, and when the *Lysogonium,* which Dr. Stiebel has described and delineated, lies on its back, it opens its mouth so that it assumes a triangular form. Out of this mouth there comes a rostrum, which moves rapidly in the water and creates a vortex; it moreover possesses muscles, which spring from the lateral margin of the animal. Generally at one end, or in young animals even at both ends, are seen very peculiar tentacula or feelers which execute a motion like that of oars; they assume different forms for the support of the rostrum and determinate purposes, and exhibit a nerve. In the member which is connected with the head-end is a kind of stomach with black hooks, which are perhaps masticatory organs, and the bag of the stomach is continued on like a rectum. The animal appears to live upon small monads. Moreover the animal has at both ends projecting shining globules with black dots; these are the eyes, which can be turned round like snails' eyes, and have a nerve. The *Lysogonium* did not appear to have two rostra, although

* Annals of Nat. Hist. 1839, p. 456. Linn. Trans., vol. xviii. p. 499.

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I have perused the above treatise* several times, but cannot determine whether it is meant as a hoax or in earnest—the former appears most probable; for with any microscopical practice the above observations could certainly not have been made with so excellent an instrument as Dr. Stiebel possesses. Notwithstanding the wonderful description, it is quite evident that *Lysogonium* is only an *Oscillatoria* whose structure M. Stiebel has altogether mistaken; he did not even see the fine rings which lie between the spores like the so-called intercellular substance, and which, when the spores escape, either separate or still adhere to each other. These rings however have led Dr. Stiebel quite astray, even the eyes have arisen out of them. What other philosophers have considered as the head of *Oscillatoriæ* Dr. Stiebel has not seen, for in *Lysogonium*, which appears to be *Oscillatoria limosa*, there is nothing of the kind.

In the Report for 1835 I have already mentioned the genus *Chionyphe* which M. Thienemann has observed in granular snow. We have now a full description of those interesting plants, which must be classed with the *Algæ*, but decidedly belong to different genera†. Three species are described; namely, *Chionyphe micans*, *nitens* and *densa*, and the whole genesis of *C. nitens* is given. The development of this plant is quite similar to that of other jointed Confervæ. M. Thienemann observed at first on the snow simple spherical vesicles, which extended lengthwise and became divided in halves by a partition, after a lively movement of previously invisible atoms had taken place in their interior. The halves of the divided vesicle kept increasing, and constantly when the molecular motion again appeared, another division took place, but subsequently only the terminal cell of each side was divided, while the central ones merely extended themselves.

Finally, a lively molecular motion arises in these terminal cells; the atoms enlarge and appear like vesicles which cause the terminal cell to swell, so that when ripe it forms a head filled with germinal globules. I must remark, that the formation of the partitions during the above-mentioned molecular motion, as well as the production of the spores by the enlarge-

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How these animals got into the interior of the *Vaucheriæ* has not been observed by any one: indeed M. Morren asserts that his plants were not at all injured; there were no openings in them through which the animal could enter. M. Morren observed the lively motion of the *Rotifer* in the interior; he saw how it ran along the sides, pushing the green matter away from it, &c.; he saw the deposition of eggs and the increase of the animals, and it appeared to him that they then descended in the tubes and remained in the new mass, where they cause, like parasitic bodies, those excrescences on the sides of the *Vaucheriæ*, just in the same manner as insects produce the gall-nuts. Once M. Morren opened the *Vaucheria* and let the animal come out, but it tried to return into its old prison.

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XLVIII.—*Descriptions of new or little known* Arachnida. By Mr. Adam White; Assistant in the Zoological Department of the British Museum.

Having been favoured by Mr. Darwin with the whole of the extensive collection of Arachnida, made by him on the voyage of H.M.S. Beagle, I intend describing them occasionally in this journal, as well as several others from Van Diemen's Land, collected by Mr. Gunn. From Mr. Bracy Clarke I have received a collection of spiders made by him in Switzerland during his travels and residence there in 1798, along with MS. notes drawn up at the time; Mr. Swainson, before setting out for New Zealand, also kindly gave me a bottle of spiders from St. Vincent's, collected by the late Lansdowne Guilding. They are all preserved in spirits of wine, as spiders should always be if possible, and, to some of Mr. Darwin's, notes are occasionally added, which I have that gentleman's permission to extract from his copious manuscript journal*. I describe them without any systematic order, but having necessarily numbered each species, intend afterwards giving a classified index: the descriptions are in many instances prolix, and I have in most cases given the *generic* character of each species. I have done this because, at present, I am unwilling to propose new names if I can possibly refer the species I describe to any of the established genera. I need hardly say, that in spiders the colours are so fugitive, that unless notes or even drawings are taken from live specimens, but little dependence is to be placed on the colours assigned in descriptions taken from the best-preserved specimens†. Travellers should be particular in doing this, as well as in taking notes of their habits, whether land or aquatic; whether they hunt for their prey by running after it—jumping upon it—or whether they conceal themselves in holes,

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[To be continued.]

XLVIII.—*Descriptions of new or little known* Arachnida. By Mr. Adam White; Assistant in the Zoological Department of the British Museum.

Having been favoured by Mr. Darwin with the whole of the extensive collection of Arachnida, made by him on the voyage of H.M.S. Beagle, I intend describing them occasionally in this journal, as well as several others from Van Diemen's Land, collected by Mr. Gunn. From Mr. Bracy Clarke I have received a collection of spiders made by him in Switzerland during his travels and residence there in 1798, along with MS. notes drawn up at the time; Mr. Swainson, before setting out for New Zealand, also kindly gave me a bottle of spiders from St. Vincent's, collected by the late Lansdowne Guilding. They are all preserved in spirits of wine, as spiders should always be if possible, and, to some of Mr. Darwin's, notes are occasionally added, which I have that gentleman's permission to extract from his copious manuscript journal*. I describe them without any systematic order, but having necessarily numbered each species, intend afterwards giving a classified index: the descriptions are in many instances prolix, and I have in most cases given the *generic* character of each species. I have done this because, at present, I am unwilling to propose new names if I can possibly refer the species I describe to any of the established genera. I need hardly say, that in spiders the colours are so fugitive, that unless notes or even drawings are taken from live specimens, but little dependence is to be placed on the colours assigned in descriptions taken from the best-preserved specimens†. Travellers should be particular in doing this, as well as in taking notes of their habits, whether land or aquatic; whether they hunt for their prey by running after it—jumping upon it—or whether they conceal themselves in holes,

* These notes, there is no use saying, were always made amid the hurry and bustle of a campaign in which annulose animals formed but a small part of the subjects of research. I prefer giving them as I find them, as there is a *freshness* about them which would be *rubbed off* were I to attempt to improve them.

† For an example, see the first description (*Linyphia argyrobapta*).